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A case of delayed-onset ventriculo-peritoneal shunt infection with *Corynebacterium* presented as ascites

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ABSTRACT

Shunt infection is one of the most common complications related to VPS insertion. Most shunt infections occur within the first year of surgery. We present a case of delayed infection 4 years after shunt insertion without intervening shunt manipulation. Our patient presented with recurrent ascites, and cultures of peritoneal fluid and CSF both recovered *Corynebacterium afermentans*. This case demonstrates that a delayed onset of ascites after shunt insertion can be secondary to infection with uncommon indolent pathogen.

1. Background

CSF flow diversion using a shunt device is a commonly performed procedure to treat hydrocephalus in pediatric patients [1,2]. Shunt infection is one of the common postoperative complications and occurs in 2%–15% of cases [1,2]. Two thirds of the shunt infections occur within the first month of the shunt surgery and almost 90% of the infections are identified within 6 months to 1 year from the time of the procedure [1–3].

Ascites is a rare complication of CSF shunt placement. Many reported cases describe sterile ascites and attribute the cause to CSF malabsorption [4–8]. Although a few cases of post shunt ascites are found to be infectious in nature, most infected cases present as pseudocysts with indolent pathogens, most commonly with *Propionibacterium acne* [6,8,9].

2. Case description

2.1. Presentation

Our patient is a 5 year-old girl who was adopted at age 3 from an Eastern European country. A VPS was placed in her birth country before she was 1 year of age. Detailed medical records of the procedure were not available for our review, but there was no known history of shunt revision. She has established care with Neurosurgery a year prior to her illness. Neuroimaging performed at that visit demonstrated a shunt system in good working order. The child was doing well in preschool, at the top of her class academically, and overall a very happy child.

Several days before presentation, her mother noted marked abdominal distention in the patient. The child had no diarrhea, no fever, no vomiting, no headaches, and no mental status change. She was convalescing from an antecedent common cold. Her parents thought she might be constipated because she had been holding her bowel movements at school due to a phobia of the bathroom there. She was brought to the emergency room. A CT scan of the abdomen was performed and demonstrated a large peritoneal fluid collection without an organized cyst associated with the tip of shunt catheter (Fig. 1). A CT of the brain demonstrated stable ventricle size. She also had elevated CRP value of 32.9 mg/L (reference range: 0–8) on laboratory evaluation with normal WBC. Neurosurgery was consulted for evaluation of possible shunt infection/malfunction. She was seen by the pediatrics as well as pediatric surgery service. It was not apparent why she developed ascites. There was low suspicion of a new underlying oncological process. She could have developed transient peritonitis from gastrointestinal causes that led to malabsorption of the CSF, and we decided to treat her symptomatically unless the ascites became a persistent issue.

2.2. Treatment

Because the shunt had not been revised since its placement and the child had no clinical signs of intracranial pathology, paracentesis of the abdomen was recommended. The peritoneal fluid was aspirated by an Interventional Radiologist and the fluid was sent for analysis. The initial

Abbreviations: CRP, C reactive protein; CSF, cerebrospinal fluid; VPS, ventriculo-peritoneal shunt; WBC, white cell count.

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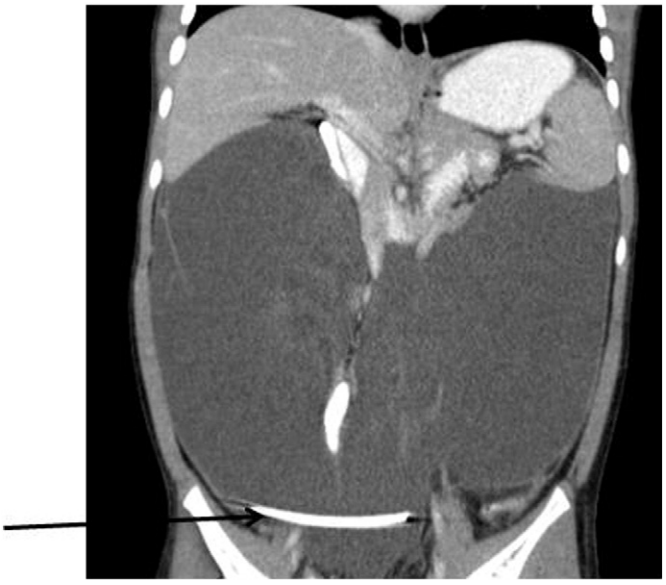

Fig. 1. Coronal view of a CT scan of the abdomen, showing large ascites in the entire peritoneal cavity. The dark arrow points at the end of the distal shunt tubing.

culture was sterile. Cytology demonstrated 345 nucleated cells/μL with 17% segmented neutrophils, 55% lymphocytes and 22% macrophages. She was observed in the hospital. After 4 days the ascites re-accumulated and she underwent another paracentesis. Cytology demonstrated 807 nucleated cells/μL with 45% segmented neutrophils, 37% lymphocytes and 16% microphages. She was discharged home 2 days later without any fever or new neurological symptoms.

She presented to the emergency room 6 days after discharge with re-accumulation of ascites. She remained afebrile and her WBC continued to be normal. Because her ascites continued to re-accumulate, Neurosurgery decided to remove the existing shunt system and place an external ventricular drain. We were subsequently informed that culture of the peritoneal fluid from her second paracentesis had recovered *Corynebacterium afermentans/coyleae*. Cultures from the shunt hardware and CSF obtained at shunt removal subsequently recovered the same organism. CSF obtained from the shunt removal surgery showed 0 WBC, concentrated sample examination showed 70% lymphocytes, 30% macrophages without any neutrophils present. Glucose and protein level was not sent of the CSF sample. She was empirically administered Vancomycin and Cefepime and treated definitively with Vancomycin for a total of 21 days from the time of shunt removal. She had 5 negative CSF cultures after the initiation of antibiotics. An evaluation of her immune system failed to identify any deficiency. We have obtained an MRI study of her brain during the course of the treatment and it showed evidence of aqueductal stenosis as the cause of her hydrocephalus. An endoscopic third ventriculostomy was performed when thick arachnoid adhesions were found in the prepontine cistern. She could not tolerated weaning of the external ventricular drain. The external ventricular drain was removed and a new ventriculo-atrial shunt was placed after 21 days of external ventricular drain and antibiotic treatment. Her ascites completely resolved during the treatment and did not re-accumulate following shunt re-internalization.

2.3. Outcome

The child remained symptom-free 1 year after the new shunt placement. She continued to do well at school without any new neurological symptoms.

3. Conclusions

A large retrospective cohort study demonstrated the occurrence of infection in >11% of pediatric patients in the first 24 months following uncomplicated initial shunt placement [10]. The authors identified multiple factors significantly associated with infection, including young age, female sex, subsequent revision, hospital volume, and surgeon case volume.

Most shunt infections occur within 1 year from the time of shunt placement, however, rare delayed shunt infections have been reported up to 11 years after shunt insertion [11]. Twenty-five to 40% of those delayed infection cases had no previous shunt revision or other sources of infection identified, suggesting the possibility of inoculation at the initial shunt placement [11,12].

Corynebacterium is a genus of catalase-producing Gram-positive bacilli, many species of which have been proven to be human pathogens. These species are recognized as emerging pathogens and should not be easily dismissed as contaminants in the setting of indwelling lines or hardware [13]. *C. afermentans* has been previously recovered from blood cultures and cultures of abscesses, and it is presumed to be part of the human skin flora [13]. Several cases of *Corynebacterium jeikeium* shunt infections have been reported: except for one patient who had left-flank pain, the others were noted to have fever and other signs of central nervous system infection without ascites or pseudocyst; and the onset of infection varied from early postoperative to months after surgery [14,15]. A case of *C. afermentans* sepsis was reported in a neurosurgical patient after tumor removal and lumbar drain placement [16]. Another case of multiple brain and liver abscess case was reported to be caused by *C. afermentans* [17]. To our knowledge, this is the first report of a ventriculo-peritoneal shunt infection caused by *C. afermentans*.

Our case demonstrates that the development of ascites years after ventriculo-peritoneal shunting can be the result of infection with indolent uncommon bacteria even in the absence of intervening shunt revision. Our patient's shunt was placed in another country where the local bacteria flora and hospital case volume are unknown. With continued increasing population migration globally and the dissemination of neurosurgical care around the world, high suspicion of unusual infections should be maintained when treating shunt patients with atypical presentations. Delayed ascites formation in a CSF shunt patient without previous shunt manipulation can be caused by indolent *Corynebacterium afermentans*.

Disclosure

The authors report no conflict of interest concerning the findings specified in this paper.

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